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1. Precipitation of Nickel Tantalide Ni_3Ta from Alloys of the Binary Nickel - Tantalum System by I I Kornilov and E N Pulaeva. Doklady Akademii Nauk SSSR 91 (1953) no. 4 (?) pp 841/843 (both figures missing)

A. Research. Within certain composition ranges, binary nickel - tantalum alloys have a two-phase structure consisting of a solid solution of tantalum in nickel and the intermetallic compound Ni_3Ta.

1) The compound was isolated from the solid solution of an alloy with 39.15% Ta in two ways:

a. by using a modification of N S Kurnakov's classic method. The solid solution dissolves readily in 5% hydrochloric acid with two to three

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drops of nitric acid, while the compound is unaffected.

b. electrolytically.

2) The compound was found to have a hexagonal structure, and to contain 49.44% Ta as compared to the theoretical 50.70%.

The importance of such separation methods, particularly for multi-component systems, is stressed.

B. The information obtained is not exactly world shaking as this compound has been known for some 20 years. Therefore the significance of the paper must rest merely in the experimental methods. These too are not new, although increasing use has been made in recent years of such procedures. As indicated by Kornilov and Pulaeva, most of the newer work has dealt with carbides extracted from steels. Generally electrolytic means have been found more suitable than purely chemical methods.

C. There is no direct indication of any practical aspect of this work. The only possible indication is a reference to the fact that Ni_3Ta is isomorphous with Ni3Cb and Ni_3Ti. In view of the role played by Ni_3Ti in the precipitation hardening of the Nimonic-type alloys used for turbine blading in jet planes, there might thus be a suspicion that the present study is indirectly related to the development of precipitation-hardenable nickel-base alloys with superior elevated-temperature properties to those now used. Pfeil, Allen and Conway indicated indirectly that tantalum was one of the elements studied in the development of Nimonic but that it was concluded "that a better balance of forgeability, high-temperature strength, and scale resistance was likely to be obtained in Ni-Cr-Ti alloys than in the other systems studied". Unfortunately, they do not detail their preliminary experiments.

L B Pfeil, N P Allen and C G Conway: Nickel-Chromium-Titanium Alloys of the Nimonic 80 Type. High-Temperature Steels and Alloys for Gas Turbines. The Iron and Steel Institute Special Report No. 43 (1952) pp 37/45

D. It is rather odd that this paper was presented not by Kornilov but by I P Bardin.

2. Effect of Boron on the Electrical Conductivity of Refined and Commercial Aluminum by A Bomon' and K R Vassel'. Acta Technica Academiae Scientiarum Hungaricae 7 (?) (1954?) pp 159/163

A. Research.

1) Boron contents up to 1% have practically no effect on the electrical conductivity of pure aluminum.

2) Titanium has a very deleterious effect on the electrical conductivity of aluminum, both pure and commercial.

3) Boron will to a large degree compensate for the harmful effect of titanium in pure or commercial aluminum if the ratio of boron to titanium is over one. This action of boron is probably the result of the formation of a titanium boride that is insoluble in aluminum.

B. This paper seems to be merely a summary of work already reported in two Hungarian papers (references 2 and 3).

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C. There is nothing particularly new in this report, except possibly the effect of a joint addition of boron and titanium on electrical conductivity.

1) The negative effect of boron and the deleterious effect of titanium have long been known.

2) The regular "EC" alloy contains closely controlled impurities and trace additions of boron. The boron addition is made mainly to refine the grain size without lowering the electrical conductivity.

3) The proposed mechanism involving the formation of an insoluble titanium boride is reasonable in view of Cibula's work.

A Cibula: The Grain Refinement of Aluminium Alloy Castings by Additions of Titanium and Boron. J Inst Metals 80 (1951) pp 1/16

D. There is no indication that the Hungarians are trying to develop a high creep strength - high conductivity alloy of the "Cond-Al" type.

R H Harrington: The Effect of Single Addition Metals on the Recrystallization, Electrical Conductivity and Rupture Strength of Pure Aluminum. TASM 41 (1949) pp 443/459

R H Harrington, L B Barker, M F Sayre and C H Holley: "Cond-Al" - a Tailor-Made Aluminum Alloy of High Creep Strength and Conductivity. Metal Progress 63 (1953) no. 5, pp 90/94

E. Apparently the Acta Technica Academiae Scientiarum Hungaricae is for everyone but the Hungarians. The present article is in Russian, and is followed by summaries in Russian, French, English and German in that order.

3. Effect of Pressure on the Eutectoidal Decomposition in a Copper Alloy with Aluminum by M I Zakharova. Doklady Akademii Nauk SSSR 91 (1953) no. 2, pp 287/289

A. Experimental. Pressure ought to affect any phase transformation that involves a volume change. Tests were made on the effect of pressure during various phases of heat treatment of a copper alloy containing 12.5% Al.

1) Formation of beta' phase. Specimens were heated under pressure to various temperatures and quenched under pressure. With a pressure of 10,000 kg/cm^2, the eutectoid temperature was 600 C plus or minus 4 C. The metastable beta' phase was formed during rapid cooling under pressure from temperatures over this temperature.

2) Decomposition of beta' to alpha plus delta phase. Pressure during heating above the eutectoid temperature and cooling from this temperature did not have any substantial effect on the decomposition of beta' on tempering. Pressure during tempering increased the temperature for both the start and finish of the eutectoidal decomposition.

B. There is a difference in nomenclature, as Zakharova's delta phase is called gamma$_2$ in the USA.

C. As far as is known, no similar work has been done here. Even in the case of steel, little work has been done on the influence of high pressures, as previously indicated in a review of Prosvirin. There seems to be no immediate practical application involved in Zakharova's work.

V I Prosvirin: Effect of Pressure on the Transformation of High Speed Steel. Vestnik Metallopromishlennosti 20 (1940) no. 7, pp 55/61

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D. The data on transformation temperatures where high pressures were not involved are in approximate agreement with those obtained here for similar alloys.

E P Klier and S M Grymko: The Transformations in Beta-CuAl Alloys. TAIME 185 (1949) pp 611/620; disc 188 (1950) pp 1066/1067

D J Mack: The Isothermal Transformation of a Eutectoid Aluminum Bronze. TAIME 175 (1948) p 240

E. Of the four references, one is not Soviet.

4. Effect of the Amount of Chromium and Manganese in the Metallic Phase on the Hardenability of Tool Steel by V V Polovnikov. Vestnik Mashinostroyeniya 33 (1953) no. 9, pp 68/70

A. Experimental. Hardenability tests were made on 24 laboratory heats with about 1% C, 0.4 to 1.8% Mn and 0.06 to 2% Cr. The depth of hardening (as determined on stepped cylindrical specimens) was related to the amount of manganese and chromium in solution (as determined by carbide separation).

1) Depth of hardening was a straight-line function of the chromium in solution at "normal" austenitizing temperatures.

2) In certain ranges, the depth of hardening increased much faster with increasing manganese in solution than would have been called for by a linear relation.

3) Various causes of the deviations of some heats from the curves were investigated. Neither residuals nor grain size seemed involved. It was concluded that the deviations resulted from differences in carbide size and composition, which affected the carbide solubility at the austenitizing temperatures used.

4) The curves obtained apply only to steels with fine grain sizes as quenched. Steels with coarser grain sizes would show a different relation.

B. A mediocre paper.

1) It has, of course, long been known that chromium and manganese increase the hardenability of high-carbon tool steels. This is confirmed by the present paper.

2) The actual data, however, are rather questionable from the standpoint of accuracy and utility.

a) Some of the data on the amount of manganese and chromium in solution appear questionable. It is impossible to find any relation between these figures and composition. For instance, heat 8 - even if accurately plotted, which it is not - deviates widely from the curve in Figure 1. Moreover, only 0.38% Cr in solution after austenitizing at 850 C is given for this heat with 2.17% Cr total, while heat 7 with comparable manganese content is reported to have 1.27% Cr out of a total of 1.55% in solution at the lower austenitizing temperature of 830 C. If the chromium in solution of heat 8 were more in line with expectations, the deviation from the curve in Figure 1 would be less marked. It is believed in this case and others that inaccuracies in these data account for some of the deviations.

b) The explanation of the deviations on the basis of carbide solubility does not make sense. The whole point of determining the amount of chromium and manganese in solution was presumably to take this factor into account.

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c) While the curves are plotted against the amount of chromium or manganese in solution, the heats are divided into groups on the basis of the total content of the other element. This is not reasonable in view of the lack of any correlation between total and dissolved manganese and chromium.

d) It is not clear how anyone could use these data without making tests for dissolved chromium and manganese, since the total chromium and manganese are not related to the amount reported to be in solution.

e) Silicon has a pronounced effect on the hardenability of carbon tool steels, but no silicon contents are reported.

C. Somewhat similar hardenability tests have been used by tool-steel producers in the USA for special applications.

5. Some Properties of Iron Powder Obtained by Atomization by V I Prosvirin and A F Silaev. Vestnik Mashinostroyeniya 33 (1953) no. 9, pp 59/61

A. Practical. Two types of atomization were studied: centrifugal atomization and atomization by compressed air. Tests showed the importance of the carbon content of molten metal being atomized in respect to compacting characteristics and the strength of the sintered compacts. Iron powder obtained by air atomization has better properties for dense and high-strength parts than iron powder obtained by centrifugal atomization. Antifriction bearings, one made without graphite and the other with the addition of 3% graphite, were successfully produced in the laboratory.

B. Both atomization methods sound similar to ones developed in Germany during World War II. The centrifugal atomization seems analogous to the Degussa or disc atomization; while the air atomization appears to be a modification of the RZ or Mannesmann process. These two methods were found highly suitable for production of iron powder and far more satisfactory than the mechanical Hametag process. At least one company in the USA (Plastic Metals Div of The National Radiator Co) produces iron powder by a somewhat similar operation involving atomization by either water or air of melted and carburized steel scrap.

Atomization is probably one of the cheapest methods of producing metal powders, although iron powder so produced is not suitable for all applications. It is interesting that Rakovskiy in 1952 pointed out the virtues of atomization as a means of mass producing iron powder.

B T duPont and R Fulton: Five ways To Make Iron Powder. Iron Age 169 (1952) no. 17, pp 135/139

C J Leadbeater: Notes on German Developments in Non-Carbide Powder Metallurgy (1939-1945). Symposium on Powder Metallurgy. The Iron and Steel Institute Special Report No. 38 (1947) pp 191/202

V Rakovskiy: Powder Metallurgy as a Factor in Conserving Metals and Lowering the Cost of Producing Parts. Za Ekonomiyu Materialov 5 (Dec 1952) pp 40/45

C. The importance of carbon content has been recognized in connection with reducing the melting point and viscosity of the molten metal, and providing sufficient carbon to combine with and thus reduce the superficial oxide on the individual particles (disc atomization) and the oxygen contained in the powder (RZ method) during annealing.

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D. The properties of the powders and sintered specimens appear normal for this type of material. It is obvious that Prosvirin and Silaev are not referring to high-density parts in the sense this term is used in the USA. The highest density they show is about 6 g/cc; whereas "high-density" sintered parts in the USA (usually made from electrolytic iron powder) would be expected to have a density of about 7.40 to 7.50 g/cc.

E. Iron-base antifriction bearings are produced in the USA and elsewhere on a commercial scale.

F. There is no indication of any mass production of iron-base parts by powder metallurgy in the USSR. Apparently there had been no change since Rakovskiy complained about the lack of progress in this field because of the underestimation of the benefits of this method by the various ministries. Rakovskiy indicated that experiments had been promising and some parts (as iron-graphite bearings) had been successfully produced on a laboratory scale, but that there was no commercial production of iron-base powder-metallurgy parts except by the Ministry for Coal Production. Prosvirin and Silaev add nothing to this picture.

V Rakovskiy: see above reference

6. New Method of Making Replicas for the Electron Microscope for Use in Investigations of the Surface Structure of Metals by I Shugar. Acta Technica Academiae Scientiarum Hungaricae 5 (1952) no. 1, pp 57/68

A. Laboratory technique. Negative polystyrene - silica replicas were not satisfactory for studying nodular iron. Bimetal positive replicas made from such negative replicas were far more satisfactory. Best results were obtained with 40 Å-thick positive replicas, half aluminum and half gold.

B. The use of positive replicas is not new although the combination of gold and aluminum is not common. Heavy plastic replicas are often dissolved after vacuum metallizing, so only a metal or metal-oxide replica is examined in the electron microscope. Basically, however, it is questioned whether the unsatisfactory results obtained with polystyrene - silica replicas may not have been due to inexperience, poor technique or inadequate equipment; inasmuch as other investigators have obtained excellent electron-microscope photomicrographs of nodular graphite using polystyrene - silica replicas. It is impossible to judge the quality of Shugar's photomicrographs from this photostatic copy, but they do not appear too impressive.

J E Rehder: Nodules and Nuclei in Nodular Iron. Amer Foundryman 21 (1952) no. 2, pp 44/48

H M Weld, R L Cunningham and F W C Boswell: Observations on Nodular Graphite. TAIME 194 (1952) pp 738/742

C. The metallurgical study of the two nodular irons used for the photomicrographs is said to be covered elsewhere. Apparently the use of magnesium and cerium was contrasted. Although cerium was the nodularizer covered in the first publication on nodular iron, magnesium has since proved to be more satisfactory and economical commercially. (Some very recent work has indicated, however, that small additions of cerium may have certain advantages in respect to neutralizing impurities.)

The composition of the two irons is given in a footnote. The silicon in both irons is high (3.44 and 4.20%), while the only phosphorus listed (0.16%) is also relatively high. Such irons would not be expected to have maximum strength and ductility at room temperature.

The Hungarians appear to be doing considerable work on nodular iron. The 1953 ASM Metal Literature Review lists three such papers, two of which deal with rolls. Nodular-iron rolls have been reported elsewhere to be far superior to ordinary rolls. Marichal Ketin in Belgium claims that alloyed nodular-iron rolls give a life two to three times longer than that of the medium-hard cast-iron rolls they replace; apparently the main interest here is for break-down or intermediate rolls. Aetna Standard in the USA has indicated an increase of as much as 50% in the tonnage rolled by nodular-iron rolls before dressing as compared with steel rolls in strip-mill and skelp-mill rolls.

B Körös (sic): 1952 Hungarian Experiments for the Production of Nodular Chilled Iron Rolls. Ontöde 4 (1953) no. 4, pp 73/82

B Koros (sic): 1952 Hungarian Experiments for the Production of Nodular Chilled Iron Rolls. Ontöde 4 (1953) no. 5, pp 97/103

D. Shugar refers to the fact that his laboratory has neither a reflecting electron microscope nor adequate equipment to use Palatnik's aluminum - polystyrene method.

E. Various typographical errors are evident.

F. Unlike the 1954 paper by Domon' and Vassel' that appeared in this same magazine and was followed by summaries in Russian, French, English and German, the present paper has summaries only in Russian and English. Both papers, however, were in Russian.

A Domon' and K R Vassel': Effect of Boron on the Electrical Conductivity of Refined and Commercial Aluminum. Acta Technica Academiae Scientiarum Hungaricae 7 (?) (1954 ?) pp 159/163

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